APPLICATION OF FDTD METHOD TO PERIODIC STRUCTURES

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This talk presents the application of the Finite-Difference Time-Domain (FDTD) algorithm with periodic boundary condition to periodic structures such as slotted antennas and periodic surfaces. An important issue for the FDTD algorithm is the termination of the computation space. Here a periodic absorbing boundary condition is used to preserve the periodic nature of the problem. As a result the computation domain can be reduced.

In this talk, the above method is applied to radiation and scattering problems. The radiation characteristics of waveguides with periodic gratings are numerically evaluated. For this type of structure, the propagating mode in the waveguide is coupled to a finite set of radiating modes or radiating directions. The performance of this type of antenna is dependent on the coupling efficiency and the near field distribution. 'l'he FDTD algorithm is used to evaluate the effects of the periodic geometry on these parameters. Scattering from periodic surfaces is also examined. Here the FDTD algorithm is applied to the scattered field only, as a result the need to segment the computation domain into the total field and scattered field regions is eliminated. The scattered field formulation also allows specification of the incident field on the scattering surface directly. The FDTD computed scattering cross sections are compared with the frequency domain methods, and numerical performance of this method with respect to surface representation and direction of incidence is evaluated.